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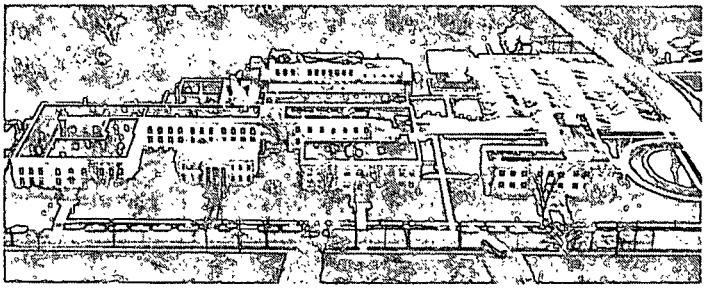


THE INSTITUTE OF PAPER CHEMISTRY, APPLETON, WISCONSIN

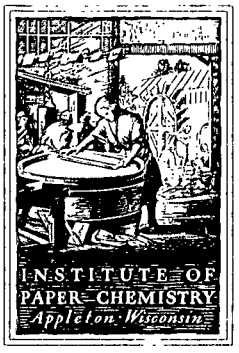
STATUS REPORT

To The

Project Advisory Committee

Systems Analysis

March 26-27, 1985
The Institute of Paper Chemistry
Continuing Education Center
Appleton, Wisconsin



THE INSTITUTE OF PAPER CHEMISTRY
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February 28, 1985

TO: Members of the Systems Analysis Project Advisory Committee

Enclosed for your review is a brief status report for the process simulation work.

Much of the effort over the last reporting period has been devoted to installing and maintaining MAPPS. The microcomputer version of MAPPS (μMAPPS) was released in December and has been supplied to several customers. We have begun work on the next release of MAPPS and μMAPPS and are incorporating many suggestions given to us by users.

This PAC meeting will be different from previous PAC meetings in that the first day will be a joint User's Group/PAC meeting. We will present many modifications of and improvements to MAPPS at this joint meeting and encourage both users and committee members to comment on MAPPS. The enclosed status report focuses primarily on issues we wish to discuss in the closed meeting on Wednesday morning. We look forward to hearing your views on these issues.

As in the past, the meeting will be held in the Continuing Education Center, and rooms and meals will be available for those who wish to stay at the Center. Please call Mrs. Sandy Berghuis (414/738-3202) by March 15 with your reservation request. For planning purposes, we would also appreciate knowing if you are unable to attend the meeting.

Sincerely,

Peter E. Parker
Group Leader
Process Modeling Group
Engineering Division

PEP/sjb
Enclosure

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AGENDA

MAPPS User's Group Meeting
Systems Analysis Project Advisory Committee Meeting

Tuesday, March 26, 1985

1:00-5:00 p.m

I. Review of Current MAPPS' Status

   A. Mainframe version

   B. Microcomputer version

II. New, supported process modules

   A. RATIO

   B. STMHTR

   C. RPRT01

   D. Bleaching modules

III. New, Unsupported Process Modules (Student Work)

   A. Alkaline sulfite-anthraquinone process

   B. Oxygen bleaching

IV. Introduction to Release 1.1 of the MAPPS Executive

   A. Conversion to FORTRAN 77

   B. File handling options

   C. Help menus

   D. Other features

5:00-6:30 p.m.

Cocktails and dinner

Agenda - MAPPS User's Group Meeting (Continued)

6:30-9:00 p.m.

I. Exchange of Public Domain Modules

   A. Mechanism

   B. Support/documentation

II. Process Model Needs

   A. Pulping/recovery

   B. Bleaching

   C. Papermaking

   D. Steam and power

   E. Woodyard

   F. Waste treatment

   G. Other

III. Physical Property Needs

IV. Desirable Executive Modifications

V. Distribution of Modifications--What is the Best Way?

VI. User's Group Future

   A. Next meeting

   B. Format

VII. Adjournment

PRELIMINARY AGENDA

Systems Analysis
Project Advisory Committee Meeting

Wednesday, March 27, 1985

8:00 a.m. - 10:00 a.m.

The following is an outline of the major issues that we would like to discuss on Wednesday morning. The status report contains more details on these issues.

I. Where Should we be in Five Years?

   A. Steady-state simulation

      1. Production control, optimization, data base utilization

      2. Process engineering/design

   B. Dynamic Simulation

      1. Process optimization and control studies

      2. Training

II. Required Resources

   A. Software

   B. Hardware

III. Third-Party Support

   A. Expected benefits

   B. Potential problems

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THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

Status Report

to the

SYSTEMS ANALYSIS

PROJECT ADVISORY COMMITTEE

Project 3471

ENERGY AND SYSTEMS ANALYSIS

February 21, 1985

PROJECT SUMMARY FORM

DATE: February 21, 1985

PROJECT NO.: 3471 - Process Modelling and Simulation

PROJECT LEADER: P. Parker

IPC GOAL:

To develop and support a marketable computer modeling capability to cover the full spectrum of mill types and problems of interest to Institute staff and member companies.

OBJECTIVE:

To develop a computer based capability to model processes in an integrated kraft pulp and paper mill.

CURRENT FISCAL BUDGET: $200,000

SUMMARY OF RESULTS SINCE LAST REPORT: (October, 1984 - February, 1985)

Ten MAPPS packages have been provided by IPC - one to each beta test site, two universities, four pulp and paper firms, and one supplier.

The microcomputer version of MAPPS (μMAPPS) was released in December. Six copies of μMAPPS are in use.

Initial waste treatment plant modelling work indicated that most treatment processes could be modelled as simple separators. Further work has been halted pending refinement of modelling needs in this area.

Bleach plant modelling work has not proceeded as expected due to staff commitments. The chlorine tower model should be ready in March, with the remainder of the models being available by mid-summer.

INTRODUCTION

Ten copies of MAPPS have been installed since it was released in July, 1984. Three of these installations are the beta test sites, two are universities, and the remainder are in pulp and paper companies or suppliers to the industry. Several companies are evaluating the simulator, and we hope to have positive decisions from them in the near future.

The microcomputer version of MAPPS (μMAPPS) was released in December, 1985. All but one of the parties under the MAPPS maintenance contract requested μMAPPS. To date, we have made only one sale based strictly on the microcomputer version. We are disappointed that there has been less interest than anticipated in μMAPPS.

We are developing the User's Group, and all purchasers of MAPPS have been invited to participate in the User's Group. The first meeting will be held in conjunction with the forthcoming PAC meeting. The combined agenda for the User's Group/PAC meeting is included with this report.

Major modelling needs must continue to be discussed by the PAC committee, with desires being expressed by the user community. Moreover, the PAC committee is needed to help define the long-range goal for this modelling effort. Our principal agenda item for this meeting is to discuss where we should be in five years with this modelling effort and the resources required to get there. Such a discussion breaks into three major pieces: the state-of-the-art in five years, our role vis-a-vis the state-of-the-art, and the resources required to evolve to that role.

STATE-OF-THE-ART

The availability of low cost, high powered micro- and minicomputers is going to make process simulation packages a standard tool for process engineers. These simulation packages will be run on engineering work stations equipped with reasonably large memories, large amounts of disk storage, graphic displays, and interconnections to mill or corporate databases. Process simulation will be used for production control, process optimization, employee training, and other areas of process analysis. Both steady-state and dynamic simulation will be important. We believe that Ole Fadum and others are correct in predicting that process control instrumentation will be part of a mill wide, if not corporate wide, database. Simulation packages must access this database to obtain current operating data for parameters and for data reconciliation and process identification studies. Engineers will expect to interface with the simulators with powerful, easy to remember commands.

Employee training will utilize simulation tools. Dynamic simulators will drive control displays as if the signals were coming from the process. Operators will then respond as if to the real process. Such simulation programs must operate in near real time, interface with controller displays, and provide adequate representation of the process.

In addition to operator training, dynamic simulation will also be used in the development of process control structures. The simulation package must provide realistic process models to incorporate into control strategy studies. A real time response is not required - only an accurate response. Graphical output, including trend charts, power spectra, auto and cross correlations, is a must for dynamic simulation.

IPC ROLE

The Institute of Paper Chemistry must capitalize on its expertise in the modelling and data acquisition/analysis areas. We must supply robust, practical, theoretically correct models for a process simulation package. We must ensure that these models fit within the process simulation framework described above. Initially, we must concentrate our efforts on developing steady-state process models that can be used for process analysis and production control. MAPPS must be structured such that it is easily interfaced with mill databases through a database language. We should also supply an optimization package for MAPPS.

We must develop, maintain, and expand the physical property data that drive process models. The MAPPS group should act as a "knowledge capturing" group for pulp and paper physical property data. These data must then be reduced to an appropriate form and included in a database that is available to a process simulation package. This database may be part of, or separate from, the mill database that is accessible to other programs.

The "user-friendly" interface will be a combination of easily remembered key words and graphics. We must make MAPPS compatible with such interface tools. The current editor needs expansion in this area to accommodate more keywords, but is probably acceptable. Graphics need to be generated by those with expertise in graphic displays. However, we need to keep abreast of display technology and software to ensure that MAPPS can be easily interfaced with such routines.

The above requirements suggest that, in the long run, MAPPS be run from a database. That is, the user selects the appropriate modules and simulation data from a database with database commands. The simulation runs and puts its

results to the database. Graphic and report writing routines then operate on these simulation data for output. This long-term view indicates that we should spend relatively little time on developing graphic and report writing additions to MAPPS. Rather, we should continue to develop MAPPS in an "open" manner that will allow other software developers to interface MAPPS with database manipulation software. To promote this open structure, we need to work with some database and graphic software to understand the kind of structures that make interfacing at least feasible, if not necessarily easy.

The development of reliable, accurate dynamic models is a super set of developing similar steady-state models. Again, IPC can, and should, capitalize on its ability to capture process knowledge.

This Institute probably does not have a major role to play in developing dynamic simulators for training purposes, although the process models developed for a simulator may be key elements in such a package.

In summary, the role of IPC should be to provide state-of-the-art process models and correlations for physical properties. This role best utilizes our unique position to act as a knowledge capturing device for the industry. The modelling group must remain aware of graphics, report writing, and database tools to ensure that MAPPS can be interfaced with them without undue effort.

The executive of MAPPS should evolve to a tool that can operate from a database or be used in a "stand alone" mode. MAPPS should include both steady-state and dynamic processes.

RESOURCE REQUIREMENTS

Development work must proceed in concert with our support activities. Personnel are the prime ingredient in such work, but hardware and software cannot be ignored.

OTHER RESOURCES

Many activities necessary to make MAPPS evolve into a fully-developed simulation program for the industry require skills that are not germane to IPC activities. Among these are: marketing, graphics development, support for many computer systems, and numerical analysis for computational efficiency. It makes good management sense to look for these skills external to IPC so the MAPPS group can concentrate in areas of its expertise. The major benefits accruing to the MAPPS program from such outside help are:

1. concentrated use of our talent in our areas of expertise;
2. rapid migration into MAPPS of current developments in process simulation (e.g., optimization, dynamics, graphics);
3. expanded marketing and support services;
4. availability of expertise in nonprocess areas, such as graphics or database structures; and
5. expanded staff for system development work.

These benefits are not without certain disbenefits. The major ones are:

1. a certain loss of control as to how the simulator develops,
2. the inability to claim MAPPS as an unique IPC product,
3. the legal problems involved,
4. the probable loss of ability to be totally knowledgeable in all areas of the simulator and the concomitant loss of abilty to totally support the simulator, and
5. the inability to distinguish between members and nonmembers of IPC for pricing and services.

One option for achieving this objective is third-party support or cross-licensing with other organizations. We are actively studying these issues now and hope to discuss them with you at the upcoming meeting.